

## CHAPTER 7

### CHILD SAFETY REQUIREMENTS FOR OUTDOOR PLAY AREAS

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#### 7-1. Introduction.

The designer should be thoroughly familiar with safety requirements for children's outdoor play areas. The U.S. Consumer Product Safety Commission (CPSC) estimates that each year in the U.S. approximately 170,000 children are treated in hospital emergency rooms and 17 deaths occur from injuries sustained on public play areas. In addition to child safety, potential liability, sustained morale, and public relations are further reasons why military installations should provide safe play areas. This chapter describes general safety guidelines that will help prevent serious injuries.

#### 7-2. Guidelines for Child Safety.

Children's outdoor play areas will meet the requirements of the CPSC *Handbook for Public Playground Safety* and the American Society for Testing and Materials (ASTM) *Standard Consumer Safety Performance Specification for Playground Equipment for Public Use* (ASTM F 1487). This chapter defines safety terms and provides additional guidance for instances where no guideline has been provided or new research has become available. For a complete review of safety requirements, CPSC and ASTM F 1487 should be consulted along with this manual. If a conflict exists between this manual, CPSC, or ASTM F 1487, the more stringent requirement will be applied.

#### 7-3. Material Selection.

Building materials will be selected that have demonstrated durability in play areas or outdoor settings. For purchased items, holes in materials should be factory-drilled. Extra holes that will not be filled in by hardware and could harbor insects should not be present.

*a. Plastic.* High density polyethylene is a material commonly used for manufactured play equipment. It is especially appropriate for slides, because plastic surfaces are less likely than metal to cause burns in hot climates. Plastic coatings, such as polyvinyl chloride (PVC), may also be used on metals that would otherwise become too hot in direct sunlight. Plastic materials should be ultraviolet (UV) stabilized to minimize fading, resistant to cracking, and shatterproof. Fiberglass should be avoided because it has low impact tolerance.

*b. Metal.* Metal requires less maintenance than wood materials and is more durable. Rust-free

metal materials, such as stainless steel and aluminum, should be selected. Metals subject to rust or corrosion should be painted, galvanized, or otherwise treated. All metal edges should be rolled or have rounded capping. Hollow metal tubes should be capped to eliminate standing water and sharp edges. To avoid the risk of contact burn injury, bare or painted metal surfaces will be avoided in regions where intense sunlight and heat can be expected, unless the surfaces are located out of direct sunlight.

*c. Wood.* Wood materials require regular maintenance to control splintering, weathering, and deterioration. Wood that is naturally rot- and insect-resistant or treated to avoid rapid deterioration should be selected. Cedar, cypress, and redwood are naturally resistant to decay, checking, and cupping. Regional species should be selected to reduce costs of site-built elements, such as benches and planters. Wood should be premium grade and free of sap wood and loose knots.

*d. Wood Preservatives and Paints.* Wood preservatives and paints used in children's outdoor play areas will meet ASTM F 1487 standards. Play area users should not be able to ingest, inhale, or absorb hazardous amounts of substances as a result of contact with preservatives and paints. Wood that is not naturally rot- and insect-resistant will be treated below the level of the play area surface and up to 150 mm (6 inches) above the play area surface.

(1) *Inorganic Arsenical.* The most common wood treatment used in play areas are the inorganic arsenical. These will be applied by the manufacturer or wood preserver according to the specifications of the American Wood Preservers Association C 17 standard. This standard states that treated wood will be visibly free of residues that may contain high levels of arsenic. Chromated copper arsenate, which causes a greenish coloration, is acceptable if the amount of arsenic on the surface of the wood that can be dislodged is minimized. Treated wood that complies with these standards may be suitable for use in children's play areas. However, arsenical-treated wood will not be used in the construction of drinking fountains or other locations where it would contact public drinking water directly or indirectly.

(2) *Other Acceptable Wood Preservatives.* According to CPSC, wood treated with other preservatives that have low toxicity may be suitable for use

in children’s play areas. These include copper or zinc naphthenates and berates.

(3) *[Unacceptable Wood Preservatives.* Several wood preservatives are too toxic or irritating to be used in children’s play areas. These include creosote, pentachlorophenol, and tributyl tin oxide. Finishes that contain pesticides will be avoided.

(4) *Paints.* All paints or similar finishes used in play areas will comply with the ASTM F 1487 standard to minimize lead exposure.

*e. Fasteners and Connecting Devices.* All fasteners and connecting and covering devices will be corrosion-resistant, such as stainless steel, brass, zinc plated metal, zinc-chromate plated metal, or galvanized steel.

(1) *Unintentional Loosening.* All fasteners, connecting and covering devices, and hardware in moving joints will not loosen or be removable without tools when installed according to manufacturer’s instructions. All nuts and bolts will be protected from detachment with lock washers, self-locking nuts, or other locking means.

(2) *Friction or Wear* All moving parts, such as swing chains, will be connected to the fixed support with bearings or bearing surfaces that reduce friction or wear. A steel cable permanently connected to a hanger assembly is acceptable.

(3) *Entanglement.* Entanglement occurs when a child’s clothing or items worn around a child’s neck become caught or entwined on play equipment or site furnishings. Strangulation, loss of a body part, or emotional injury may result. Fastening devices, such as S-hooks, pelican hooks, C-hooks, or clevis devices, will be closed as specified by ASTM F 1487 to prevent possible entanglement.

*f. Chain, Cable and Rope.* Verification should be obtained from manufacturers that chain and cable meet structural integrity requirements specified by ASTM F 1487. Chain should be a minimum size 4/0 and zinc plated. Cable should be a minimum 25 mm (1 inch) diameter and be composed of strands of steel cable with a synthetic covering of polypropylene or dacron. Rope will not be used in unsupervised children’s outdoor play areas. Cable and chains that are not properly designed can cause strangulation or injuries. To avoid these hazards, all chains and cables will meet ASTM F 1487 requirements.

*g. New Construction Materials.* New materials are constantly being developed for manufacturing use. Recent examples include the increased use of plastics and recycled materials. If any materials used in construction do not have demonstrated durability in play areas or the outdoors, documentation or test results will be obtained from manufacturers to verify durability.

7-4. Head and Neck Entrapment.

All elements within the play area will be designed, constructed, and assembled to reduce the risk of accidental head or neck entrapment when children enter any opening headfirst or feetfirst. Entrapment occurs when a child’s head or neck becomes lodged within a space and cannot be withdrawn. Strangulation or emotional injury can result. Both the opening size and shape are considered in determining entrapment potential. Any opening that is closed on all sides and all angular openings will meet the entrapment criteria specified in ASTM F 1487. This ASTM standard includes testing criteria that can be used to evaluate opening size and shape for entrapment potential.

7-5. Maximum Recommended Equipment Heights by Age Group.

Play equipment should be selected that allows safe and successful use by children of a specific chronological age, mental age, and physical ability. Play equipment height and complexity should not exceed the user’s ability as defined by tables 7-1 and 7-2. These tables are based on the average user in each age group. An individual child’s skills may vary from these averages and must be assessed by parents and guardians.

7-6. Multiple Exits.

A minimum of two exits should be provided on all play equipment, including composite structures and playhouses. Climbers, such as rung ladders, climbing nets, and arch climbers, should not be used as the sole means of access to equipment intended for children under age five. A playhouse window may qualify as an exit if it is a minimum of 400 mm (16 inches) in diameter.

7-7. Pinch, Crush, and Shear Points.

Pinch, crush, or shear points are junctures that could cause contusion, laceration, abrasion, amputation, or fracture during use. A pinch, crush, or shear point is defined by ASTM F 1487 as any point that entraps a 16 mm (5/8-inch) diameter rod at one

Table 7-1. Recommended Composite Structure Platform Heights.

Age Group	Maximum Platform Height	
	Millimeters	Inches
12-24 months	900	36
2-5 years	1200	48
5-12 years	1400	56

Table 7-2. Maximum Recommended Play Equipment Heights.

Play Events	6 weeks- 12 mos.	12-24 mos.	2-5 years	5-12 years
Balance beam (maximum height)	N/A	N/A	300 mm (12 inches)	400 mm (16 inches)
Banister slide (maximum height of attached platform)	N/A	N/A	N/A	1400 mm (56 inches)
Chinning/turning bars (maximum height)	N/A	N/A	1500 mm (60 inches)	2100 mm (84 inches)
Clatter bridge (height to bridge surface)	N/A	N/A	760 mm <sup>b</sup> (30 inches)	1200 mm (48 inches)
Climber - freestanding (maximum height)	N/A	N/A	1500 mm <sup>c</sup> (60 inches)	1500 mm (60 inches)
Climber - attached to composite (maximum height)	N/A	N/A	1200 mm <sup>c</sup> (48 inches)	1400 mm (56 inches)
Climber - arch (maximum height, attached to composite structure)	N/A	N/A	1200 mm <sup>c</sup> (48 inches)	1400 mm (56 inches)
Climber - arch - freestanding	N/A	N/A	N/A	1500 mm (60 inches)
Climber - net - installed at 90° (maximum height)	N/A	N/A	2400 mm (96 inches)	2400 mm (96 inches)
Climber - net- installed at 60° (maximum height)	N/A	N/A	N/A	1400 mm (56 inches)
Fire pole (maximum height of attached platform)	N/A	N/A	N/A	1400 mm (56 inches)
Horizontal ladder (maximum height)	N/A	N/A	1500 mm <sup>c</sup> (60 inches)	2100 mm (84 inches)
Parallel bars (maximum height)	N/A	N/A	N/A	900 mm (36 inches)
Playhouse - freestanding (maximum height at roof ridge)	1800 mm (72 inches)	1800 mm (72 inches)	1800 mm (72 inches)	1800 mm (72 inches)
Ring trek (maximum height - rings to safety surface)	N/A	N/A	N/A	2100 mm (84 inches)
Slide (maximum height at entrance)	N/A	900 mm <sup>a</sup> (36 inches)	1200 mm (48 inches)	1400 mm (56 inches)
Spring rocking equipment (maximum seat height)	N/A	N/A	700 mm (28 inches)	N/A
Stationary bridge (maximum height to bridge surface)	No potential fall	900 mm (36 inches)	1200 mm (48 inches)	1400 mm (56 inches)

<sup>a</sup>Recommended for ages 2 and older.<sup>b</sup>Recommended for ages 3 and older.<sup>c</sup>Recommended for ages 4 and older.

Table 7-2. Maximum Recommended Play Equipment Heights--Continued

Play Events	6 weeks- 12 mos.	12-24 mos.	2-5 years	5-12 years
Swings - to-fro (maximum crossbeam height)	2100 mm (84 inches)	2100 mm (84 inches)	2400 mm <sup>b</sup> (96 inches)	2400 mm (96 inches)
Swings - rotating (maximum crossbeam height)	N/A	N/A	2400 mm <sup>b</sup> (96 inches)	2400 mm (96 inches)
Track ride (maximum height - hand hold to safety surface)	N/A	N/A	N/A	2100 mm (84 inches)
Tunnel (maximum height of attached deck)	Ground level No potential fall	900 mm (36 inches)	1200 mm (48 inches)	1400 mm (56 inches)

<sup>a</sup>Recommended for ages 2 and older.<sup>b</sup>Recommended for ages 3 and older.<sup>c</sup>Recommended for ages 4 and older.

or more positions. Accessible crush, pinch, or shear points will not be provided in outdoor play areas. To reduce the likelihood of unintentional contact with a pinch, crush, or shear point, openings will meet the specifications of ASTM F 1487. Chain and the hardware that attaches it to equipment are exempt from pinch, crush, and shear point requirements. The attachment area of heavy duty coil springs to the body and base of rocking equipment is also exempt.

#### 7-8. Protective Barriers.

Protective barriers are enclosures that help keep children from falling off elevated platforms. A protective barrier is a vertical surface, game panel, series of vertical or diagonal bars spaced less than 90 mm (3-112 inches) apart, or other design free of footholds or handholds that may facilitate climbing. For

children ages 5 through 12 years, any play equipment platform over 750 mm (30 inches) in height above the playing surface will be surrounded with a protective barrier a minimum 970 mm (38 inches) high. For children under 5 years, any play equipment platform over 500 mm (20 inches) in height above the playing surface will be surrounded with a protective barrier. A protective barrier a minimum 740 mm (29 inches) high will be provided for children ages 2 to 5 years. For children under 2 years, a protective barrier a minimum high 500 mm (20 inches) will be provided. ASTM F 1487 also allows the use of a guardrail for some platform heights and age groups. However, guardrails provide less protection. Therefore, the use of guardrails will be avoided, except when necessary for play equipment function, e.g., on moving bridges. Protective barrier requirements are illustrated in figure 7-1.

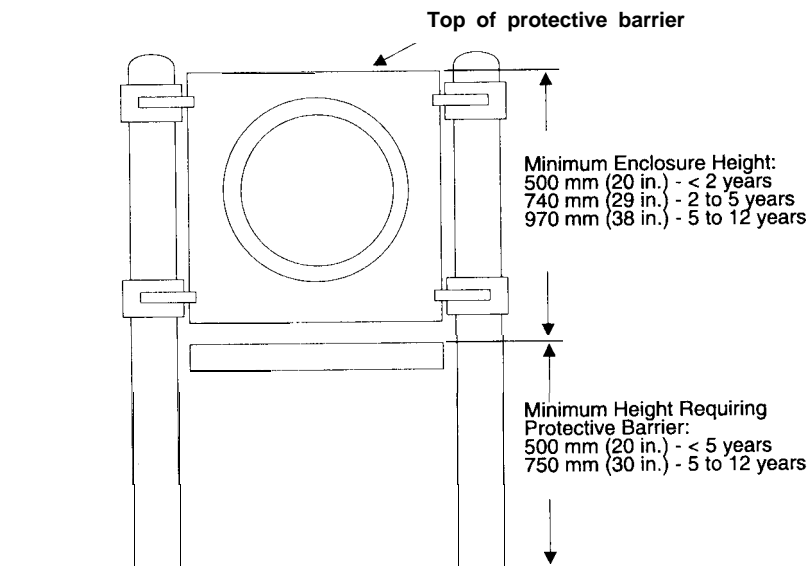


Figure 7-1. Protective Barrier Requirements.

### 7-9. Protrusions.

Protrusions are hardware, pipes, posts, or other structural members that extend in any direction from play equipment, site elements, or site furnishings. Protrusions may catch a child's clothing causing strangulation or loss of balance. Protrusions may also pose a potential impact hazard. Hardware that increases in diameter from the surface to the exposed end and caps or coverings that do not fit flush against the nut or surrounding surface are two examples of protrusions that are likely to catch a child's clothing. All protrusions will meet the requirements of ASTM F 1487.

### 7-10. Sharp Points and Edges.

A sharp point or edge is one that can puncture or cut a user's skin. Accessible sharp points or edges will not be provided in the outdoor play area. Manufacturers will provide verification that all points and edges meet ASTM F 1487 standards.

### 7-11. Use Zones.

A use zone is the clear area under and around play equipment where a child could land when falling, jumping, or exiting from the equipment. For all play equipment, an unobstructed use zone covered with safety surfacing will be provided, which at minimum conforms to ASTM F 1292 for the highest accessible equipment fall height (chap 11). This criteria reduces the likelihood of life-threatening head injuries that often result from falls from play equipment. Use zones should not overlap except where indicated. Figure 7-2 provides an example of adjacent play equipment without overlapping use zones. The use zone dimensions depend on the equipment type and users' age group. Use zone requirements for each type of play equipment are provided in chapter 10.

*a. Typical Use Zone.* Figure 7-3 illustrates a typical manufactured play equipment use zone. For infant to 2 years, provide a minimum 1800 mm (72-inch) use zone from all sides of the equipment. For ages 2 through 12 years, provide a minimum 2400 mm (96-inch) use zone from all sides of the equipment. Some equipment, such as to-fro swings and tire swings, have greater requirements.

*b. Typical Overlapping Use Zone.* An overlapping use zone may be provided for some equipment, such as two playhouses which are not designed for climbing, two balance beams under 500 mm (20 inches) high, and two spring rockers with a seat height of 750 mm (30 inches) or less. Figure 7-4 illustrates a typical overlapping use zone.

*c. High Use Play Areas.* Sufficient space should be provided between all adjacent structures and individual play equipment for play and circulation.

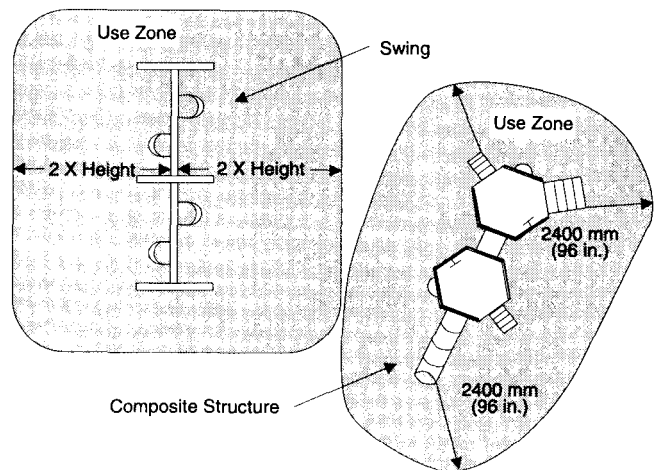


Figure 7-2. Adjacent Play Equipment without Overlapping Use Zones.

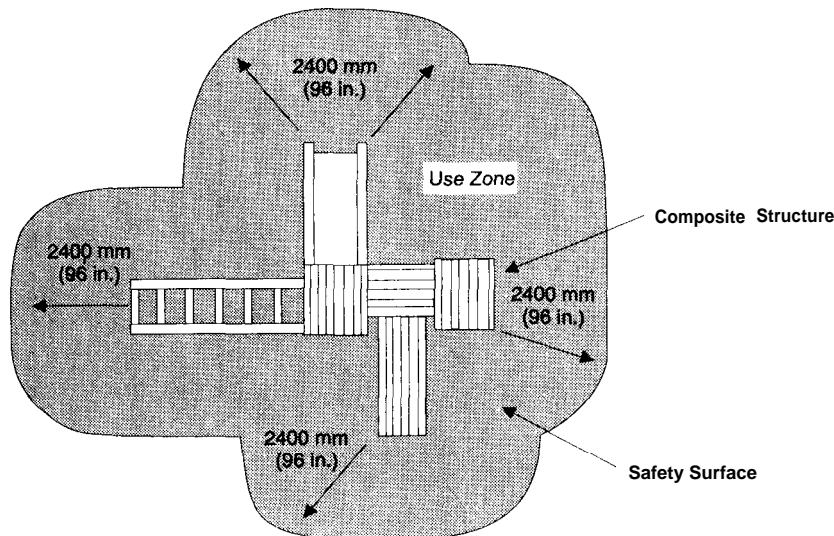


Figure 7-3. Typical Use Zone.

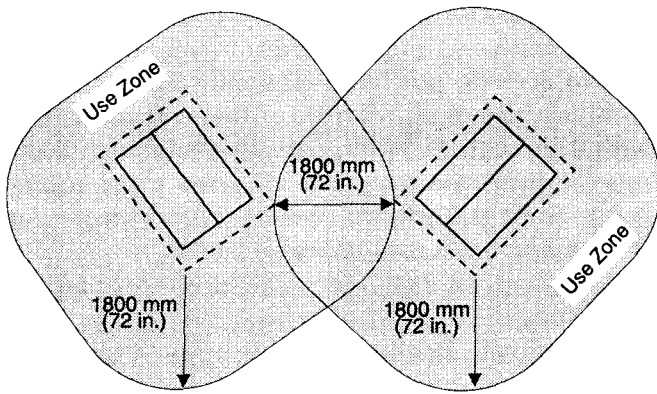


Figure 7-4. Typical Overlapping Use Zone.

In settings where periodic overcrowding is likely, a supplemental circulation area beyond the use zone is recommended.

#### 7-12. Utilities.

Play area utilities will support child safety and not expose children to hazards.

*a. Water Only* cold, potable water will be provided.

*b. Electricity.* Provisions for utility metering, transformers, and other electrical equipment will be located in locked vaults or utility rooms away from children's play areas.

*c. Storm and Sanitary Sewers.* Drainage grates will be locked. Grate shape or fastening device will prevent incorrect placement of grates by maintenance staff.

*d. Utility Boxes.* Utility boxes will be locked and located outside of the play area. The boxes will never be located within play equipment use zones.

*e. Telephones.* Telephones for emergency communication are recommended in neighborhood and community parks.

*f. Power Circuits.* Ground fault circuit interrupters (GFCI) should be provided for all outdoor power circuits.